How Does Energy Flow Through Ecosystems?

Worksheet

Energy flows: sun producers (photosynthesis) consumers decomposers. Only ~10% is transferred at each trophic level; 90% is lost as heat, respiration and movement.

Questions

1. If plants in an ecosystem contain 50,000 kcal, approximately how much reaches herbivores?

A) 5,000 kcal
B) 45,000 kcal
C) 500 kcal
D) 50,000 kcal

2. Why are there always more plants than herbivores in an ecosystem?

A) plants grow faster
B) herbivores need 10 the plant biomass
C) plants are smaller
D) herbivores migrate

3. In a four-level food chain (plants herbivores small carnivores large carnivores), which has the least total biomass?

A) plants
B) herbivores
C) small carnivores
D) large carnivores

4. What happens to the 90% of energy lost at each trophic level?

A) stored for later use
B) converted to heat and respiration
C) transferred to decomposers
D) removed from ecosystem

5. A field produces 100,000 kcal/year. How much energy is available to herbivores?

6. If herbivores have 10,000 kcal, how much energy reaches carnivores?

7. Why can't we have long food chains with many trophic levels?

8. Define: What is the 10% rule?

9. Define: Why is energy lost between trophic levels?

10. Define: What is an energy pyramid?

Answer Key

1. A) 5,000 kcal - 50,000 10% = 5,000 kcal. The 10% rule determines energy transfer between levels.

2. B) herbivores need 10 the plant biomass - Herbivores can only use ~10% of plant energy, so they need a much larger plant biomass to survive.

3. D) large carnivores - Energy decreases at each level. Top predators have the smallest biomass because they receive the least energy.

4. B) converted to heat and respiration - 90% is used for metabolism, movement, and heat; only ~10% is stored in body tissue for the next level.

5. Energy to producers (plants) = 100,000 kcal/year Energy to primary consumers (herbivores) = 100,000 10% = 10,000 kcal/year

6. Energy to herbivores = 10,000 kcal Energy to secondary consumers (carnivores) = 10,000 10% = 1,000 kcal

7. Each level loses 90% of energy. After 4-5 levels, remaining energy is too small to support any organisms. Most ecosystems have 3-4 trophic levels maximum.

8. ~10% of energy is transferred to the next trophic level; ~90% is lost as heat and respiration.

9. Organisms use energy for movement, respiration, and heat. Only the stored chemical energy in body tissue is available to the next level.

10. A diagram showing energy available at each trophic level, always widest at producers and narrowest at top predators.